Recovery in Young Children with Weight Faltering: Child and Household Risk Factors

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Objective To examine whether weight recovery among children with weight faltering varied by enrollment age and child and household risk factors.

Study design Observational, conducted in an interdisciplinary specialty practice with a skill-building mealtime behavior intervention, including coaching with video-recorded interactions. Eligibility included age 6-36 months with weight/age <fifth percentile or crossing of 2 major percentiles. Children were categorized as <24 months vs ≥24 months. Child and household risk factors were summed into risk indices (top quartile = elevated risks, vs reference). Outcome was weight/age z-score change over 6 months. Analyses were conducted with longitudinal linear mixed-effects models, including age by risk index interaction terms.

Results Enrolled 286 children (mean age 18.8 months, SD 6.8). Significant weight/age recovery occurred regardless of risk index or age. Mean weight/age z-score change was significantly greater among younger compared with older age (0.29 vs 0.17, $P = .03$); top household risk quartile compared with reference (0.34 vs 0.22, $P = .046$); and marginally greater among top child risk quartile compared with reference (0.37 vs 0.25, $P = .058$). Mean weight/age z-score change was not associated with single risk factors or interactions; greatest weight gain occurred in most underweight children.

Conclusions Weight recovery over 6 months was statistically significant, although modest, and greater among younger children and among children with multiple child and household risk factors. Findings support differential susceptibility theory, whereby some children with multiple risk factors are differentially responsive to intervention. Future investigations should evaluate components of the mealtime behavior intervention. *(J Pediatr 2016;170:301-6)*.

Growth monitoring is a central component of pediatric primary care.[1] Failure-to-thrive (weight faltering)[2] in the first 1000 days (conception to age 24 months) has been associated with long-term negative health and developmental consequences.[3] Strategies to prevent weight faltering often focus on child, family, and household risk factors that have been associated with weight faltering.[2,4,5] Child risks include prematurity,[6] low birth weight,[6] stunting[7,8] (an indicator of chronic undernutrition), developmental delays,[2] and concurrent medical problems.[2] Feeding problems (eg, food refusal, pickiness) are common among children with weight faltering.[9] Temperamentally easy children establish self-regulatory feeding behaviors,[10] whereas temperamentally difficult children tend to resist change and be at risk for poor appetite and feeding problems, particularly if they are hypersensitive or dysregulated.[2,4,5] Although difficult temperament has been associated with feeding problems,[11] the association may be mediated by parental feeding practices.[12]

Family and household risks for weight faltering include lack of household stability indicated by multiple moves and crowding,[13,14] single parenthood,[15] low maternal education,[16] maternal depressive symptoms,[17-19] mealtime stress,[9] poverty,[20,21] and a history of maltreatment and incarceration.[22] Food insecurity in high-income countries has not been associated with weight faltering in young children[23] but may limit the quality of available food, increasing the risk for nutritional deficiencies.[24]

Referrals to specialty clinics for weight faltering often result in weight recovery,[25,26] but little is known about how recovery relates to the multiple risk factors that frequently co-occur with weight faltering.[27]

In many cases, interventions are designed to reduce risk factors. However, the differential susceptibility theory (DST) suggests that some children are differentially susceptible to adversity and environmental interventions[28]; they may be both negatively affected by risk factors and positively affected by environmental interventions. If DST applies to children with weight faltering, children with multiple risk factors may have a positive response to a skill-building intervention. To examine this possibility, we implemented an intervention grounded in social cognitive theory (SCT) in a growth and nutrition clinic addressing mealtime behavior and eating habits through caregiver modeling and self-efficacy.[29,30] For this study, we examined whether children

CR	Child risk factor index
DST	Differential susceptibility theory
HR	Household risk factor index
SCT	Social cognitive theory

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with multiple risk factors were differentially responsive to the intervention, and also whether children enrolled early in life, within the first 24 months, experienced better weight recovery than older children.

Methods

Children experiencing weight faltering (weight/age <fifth percentile or crossing 2 major percentiles) were referred by their primary care provider to an interdisciplinary specialty practice in a mid-Atlantic urban medical center from 2010 through 2014.

Caregivers were invited to participate in a weight recovery study that was approved by the University's Institutional Review Board. Over 95% of caregivers agreed, and signed informed consent for themselves and their child. Inclusion criteria were age 6-36 months, oral feeding, and no known genetic disorders. Caregivers did not receive compensation. Children who completed at least 2 follow-up evaluations were retained in the longitudinal analysis.

The procedures were part of usual care in the interdisciplinary practice. Medical records were reviewed, and caregivers completed an intake evaluation, including questionnaires on demographics, service receipt, feeding patterns, and child temperament. Children were weighed and measured by a trained medical assistant. The enrollment evaluation included individual clinician evaluations (pediatrician, psychologist, and dietitian) and a video-recorded mealtime observation.[31,32]

At the conclusion of the initial evaluation, families received a notebook with the child's growth chart, a calendar, information on infant/toddler nutrition and development, and specific recommendations. A comprehensive report was sent to the referring physician and children were scheduled for a follow-up appointment.

During all visits, children were undressed to a clean diaper or underpants and weighed and measured in triplicate using standardized procedures. Z-scores for growth variables were calculated based on age- and sex-specific Centers for Disease Control and Prevention growth charts.[33] Data on 7 child risk factors and 9 household risk factors were collected at enrollment (Table I). The 2-item food security screener[38] was added to the intake procedure after the study was initiated and therefore not included in the risk indices.

Intervention

The skill-building mealtime behavior intervention was provided to all families as part of usual care in the clinic and included 4 components.

Access to Healthy Food. Families were counseled to provide a healthy and diverse diet (fruits, vegetables, dairy, whole grains, and meat), to avoid high sugar/salt, low nutrient dense foods and beverages, and to increase calories in their children's food by adding butter, oil, cheese, or peanut butter, and if necessary, to give nutritional supplements after meals, not as meal replacements.

Healthy Eating Habits. To build healthy habits, families were encouraged to establish consistent routines (times and places) for family meals and snacks, eliminate grazing,[39] minimize distractions (television), engage in pleasant conversation about daily events, and eat together with children seated at eye level with their caregivers to promote modeling.[40]

Appetite and Autonomy. To increase appetite, children should be hungry at meals, encouraged to touch and pick up food (progressing from finger feeding to utensils),[41] and be actively involved in meal preparation.[42]

Responsive Feeding. Responsive feeding refers to the caregiver-child relationship.[43] Through a coaching process, caregivers viewed the video-recorded mealtime interaction

Table I. Child and household risk factors gathered at enrollment

Risk factors	Source	Criteria
Child		
Low-birth-weight/prematurity	Caregiver report, medical record	Birth-weight <2500 g or gestational age <37 wk
Stunting	Measured	Length/age <−2 z-scores
Temperament: hypersensitivity and dysregulation	Hypersensitive and dysregulation subscales, TABS[34]	Top quartile
Medical comorbidities	Caregiver report, medical record	Medical specialty services
Developmental risk	PEDS[35]	>1 developmental concern or early intervention services
Feeding problems	Feeding subscale, BPFAS[36]	Top quartile
Household		
Moves	Caregiver report	≥2 in the past y
Crowding	Caregiver report	>2 child/adult ratio or >6 household members
Single	Caregiver report	Not married
Maternal education	Caregiver report	<high school education/GED
Depression	2-item depression screening questionnaire[37]	Endorsement of ≥1 item
Mealtime stress	Parent subscale, BPFAS[36]	Top quartile
Extreme poverty	Caregiver report	Receipt of temporary assistance for needy families
Maltreatment	Caregiver report	Child protective services
Incarceration	Caregiver report	Incarceration of family member

BPFAS, Behavioral Pediatrics Feeding Assessment Scale; *GED*, general educational development; *PEDS*, Parents' Evaluation of Developmental Status; *TABS*, Temperament and Atypical Behavior Scale.